

ORIENTATION PAPER: RESEARCH POTENTIAL RELATED TO GREEN DEAL

Prepared November 2020 by the European Metrology Network for Climate and Ocean Observation.

EMN for Climate and Ocean Observation Stakeholder Needs Review

The EMN for Climate and Ocean Observation has a scope that covers metrological support for in situ, ground-based and remote sensing observations of atmosphere, land and ocean Essential Climate Variables (ECVs) for climate observations and also to support the broader economic and ecological applications of Essential Ocean Variables (EOVs) observations. The stakeholders of the EMN are those who make or use climate and ocean observations.

During 2020 the EMN carried out an extensive stakeholder needs review based on (a) a detailed review of strategy documents prepared by key organisations such as the WMO, EOOS and CEOS (b) a set of online surveys that received 55 replies, (c) four stakeholder workshops attended by ~100 people, and (d) participating in stakeholders’ committees. A full report of this review is available on the EMN website.

Importance of observations in supporting the European Green Deal

The European Green Deal defines the European Union’s highest priority objectives to tackle climate and environmental challenges while rebuilding Europe’s economies after the pandemic. The figure below shows how observations can support the ambitious Green Deal.

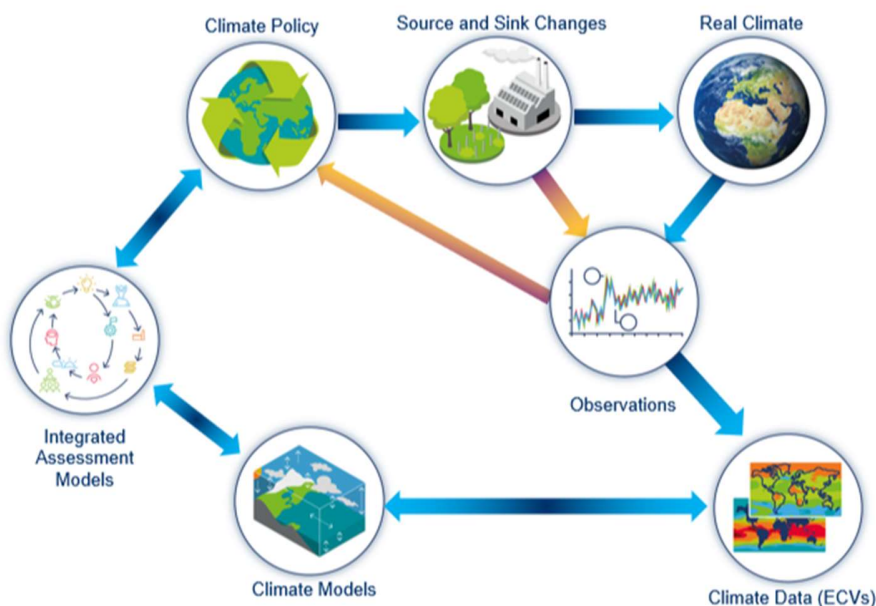


Figure 1: This diagram shows two “feedback loops” to climate policy. The short (annual) loop (gold) shows observations monitoring greenhouse gas emissions and land use change. These observations ensure that policies are implemented and inform the documented emissions inventory.

The longer (decadal) feedback loop (blue) shows how the Earth system is responding to anthropogenic climate change. Observations of the real climate through Essential Climate Variables underpin climate science and our understanding of the past, present and future climate. Climate models and the socio-economic integrated assessment models use the scientific understanding of the climate system gained from observations to inform policy decisions.

Climate policy now focusses on reaching climate neutrality by 2050, with [enhanced interim reduction targets set for 2030](#). The Green Deal is a massive investment to meet these challenging goals and it is essential that progress is monitored. Observations of emissions and land use changes (gold loop in figure) provide a direct feedback on the implementation of policy. Such observations need to be improved to allow for direct attribution of emissions to specific locations, and so that they can be used directly in the inventory. Observations are also required of essential climate variables to advance climate science and to observe climate trends (blue feedback loop). Improvements in climate observations will provide more detailed, local information and will enable us to observe climate trends more rapidly.

Recognising the importance of observations to support policy and decision making, the European Union [has invested over 8 billion euros in the Copernicus Programme](#) to provide authoritative and quality-assured data about the state of the environment for governments and industry.

Metrological challenges of observation

Observations that inform climate policy must have rigorous quality assurance through the whole value chain. The observations must have long-term stability (so that climate trends can be seen), be globally consistent and linked to a common reference (ideally SI) and have robustly-determined uncertainties associated with them. It also requires that the models used in the data analysis are themselves quality assured and have associated uncertainties. Note that models are used to interpret raw observations, and to process such observations into ECVs, as well as in climate prediction and reanalysis. Metrology can contribute to the quality assurance of both observations and models.

Key priorities identified through EMN stakeholder needs review

Based on our consultations, the EMN for Climate and Ocean Observation identified 35 priority metrology challenges for climate and ocean observation. These included:

- Metrological support for the definition of new measurands, development of reference methods and reference materials for some ECVs where traceability is not fully established for the end-users' measurement results (see report for list) by independent metrological approaches.
- Metrological support to establish reference networks and "supersites" for climate-quality observations for ground-based networks and as fiducial references for remote sensing. Also supporting comparisons of in situ (atmosphere, ocean, land) and ground-based observations.
- Developing a metrologically-based quality assurance framework and associated methods and tools for both direct observational data and the processing of such data to ECV products. Including the definition of standards, vocabularies and ontologies for metrological techniques.
- Metrological assessment of uncertainties of data and information derived from models and algorithms, and for historical data supporting data rescue.
- Propagation of uncertainties through to commercial and societal decisions – how uncertainty should be translated into economic and social risk.

Recommended PRT topics

We encourage broad cross-disciplinary projects that align with the scope of the EU's Green Deal and therefore we encourage PRTs to address metrology needs in the following areas:

- Metrology to underpin the quality assurance and regulatory framework needed to support the carbon stocktake at national and global scales.
- Metrology to support sustainable economic growth and the health of European citizens in an environment impacted by climate change.
- Metrology to support the scientific understanding of Earth natural cycles and associated impact on the bio/geo sphere as a result of environmental change.
- An observational framework capable of enabling detection of change in climate-sensitive indicators which can monitor progress in the results of climate mitigation strategies. Providing the evidence to policy makers to facilitate any necessary climate action in a timely manner.
- Metrological tools, methods to facilitate integration and harmonisation of local and globally collected data and its transformation to information through models and algorithms with robust fit for purpose quality metrics.